

Writing equations for conjugate acid/base pairs

1) (i) Complete the table below to show the conjugate acid-base pairs.

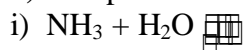
Conjugate acid	Conjugate base
HCO_3^-	
H_2O	
	CN^-

(ii) $\text{HPO}_4^{2-}(\text{aq})$ is a species that can act as an acid or a base.

Write equations for the reactions of HPO_4^{2-} with water: one where it acts as an acid, and one where it acts as a base.

HPO_4^{2-} acting as	Equation
an acid	$\text{HPO}_4^{2-} + \text{H}_2\text{O} \rightleftharpoons$
a base	$\text{HPO}_4^{2-} + \text{H}_2\text{O} \rightleftharpoons$

2) Complete the equations below to show how each species will react with water.



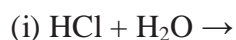
3 i) Identify one conjugate acid / base pair for the following reaction:



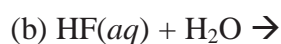
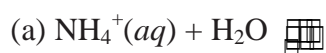
ii) $\text{HSO}_4^-(\text{aq})$ is a species that can act as an acid or a base.

Write two equations for reactions of HSO_4^- with water: one equation where it acts as an acid, and one where it acts as a base.

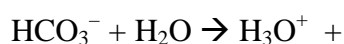
4) Complete the equations below to show how each species will react with water to form an acidic solution.



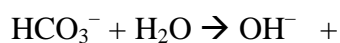
5) Complete the equations below to show how each species will react with water to form an acidic solution.



6) (a) The bicarbonate ion, HCO_3^- , can both accept and donate hydrogen ions (protons). Complete the equations below.



Reaction A



Reaction B

(b) When sodium bicarbonate, NaHCO_3 , dissolves in water the solution is basic.

Circle **Reaction A** or **Reaction B** to show which reaction predominates. Justify your answer.

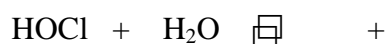
7) (a) Complete the table below to show the conjugate acid-base pairs.

Conjugate acid	Conjugate base
NH_4^+	
H_2PO_4^-	
	Cl^-
	HSO_4^-

b) **Circle** the ion below that can act as both an acid and a base. Justify your choice.

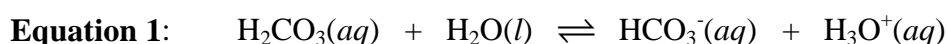


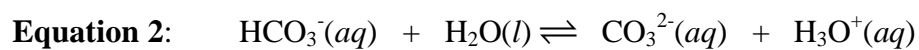
c) Hypochlorous acid is a weak acid. Complete the equation below to show the reaction of hypochlorous acid with water.



d) A solution of sodium hypochlorite, NaOCl , is basic. Discuss the above statement, including appropriate chemical equation(s) in your answer.

8) Chickens make egg shell, CaCO_3 , using carbon dioxide gas from the air. The carbon dioxide forms carbonic acid (H_2CO_3), which then reacts to form the carbonate ions (CO_3^{2-}) needed to make egg shell. Two equations showing part of this process are given below.





(a) Identify three conjugate acid-base pairs in the equations above.

(a) Identify three conjugate acid-base pairs in the equations above.

(b) HCO_3^- can act as both an acid and a base.

Specify which equation above (**1** or **2**) shows HCO_3^- acting as an **acid**.

Give a reason for your answer.